



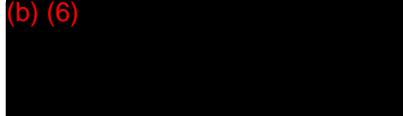
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6

1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

October 16, 2015

(b) (6)



RE: Wilcox Oil Company Superfund Site – Residential Data Results

Dear Mr. and Mrs. (b) (6)

This letter provides you with a summary of the soil data results for your property. Based on our review of the data, soil samples collected from your property did not exceed levels considered acceptable by EPA for short-term exposures. Although some concentrations exceeded their Residential Screening Level (RSL) for soil, this is merely an indication that further evaluation may be needed. The concentrations that exceeded the RSL are expected to fall within the accepted range established by EPA for long term exposures.

Table 1 presents the results for those chemicals detected in the soil and exceeding the RSL. All other data fell below the RSL. Arsenic was detected in every sample with the highest result being 4.4 milligrams per kilogram (mg/kg) at a depth of 6 – 12 inches below ground surface (bgs). Published reports have documented the background range of arsenic concentrations for Oklahoma as being 0.6 to 21 mg/kg. The highest result of 2.1 mg/kg falls within the range of background concentrations. Several Polycyclic Aromatic Hydrocarbons were detected as presented below.

Table 1

Grid	Depth	Chemical	Concentration mg/kg	Screening Level mg/kg
Grid 1	0 – 2 inches bgs	Benzo(a)anthracene	0.2	0.16
		Benzo(a)pyrene	0.17	0.016
		Benzo(b)fluoranthene	0.22	0.16
		Dibenzo(a,h)anthracene	0.028	0.016
	2 – 6 inches bgs	Benzo(a)anthracene	0.25	0.16
		Benzo(a)pyrene	0.17	0.016
		Benzo(b)fluoranthene	0.24	0.16
		Dibenzo(a,h)anthracene	0.029	0.016
Grid 4	0 – 2 inches bgs	Benzo(a)pyrene	0.02	0.016
Grid 5	0 – 2 inches bgs	Benzo(a)pyrene	0.019	0.016
	2 – 6 inches bgs	Benzo(a)pyrene	0.037	0.016

The Residential Soil Screening Levels represent conservative levels developed using risk assessment guidance from the EPA Superfund program. RSLs are considered by the Agency to be protective for humans (including sensitive groups) over a lifetime of exposure. RSLs are not cleanup standards and are used for site "screening" to help identify areas, contaminants, and

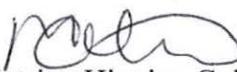
conditions that may require further investigation at a particular site. Generally, at sites where contaminant concentrations fall below RSLs, no further action or study is warranted under the Superfund program, so long as the exposure assumptions at a site match those used to develop the RSL. Chemical concentrations above the RSL do not automatically trigger a response action; however, exceeding the RSL suggests that further evaluation of the potential risks by site contaminants is appropriate. In addition, further evaluation of the potential risks related to site contaminants that were detected in the soil but have no RSL is appropriate. As we move forward with our site investigation, we will be evaluating these contaminants in more detail through a Site-specific Human Health Risk Assessment to determine the potential risks these contaminants may pose. For additional information related to Arsenic and Polycyclic Aromatic Hydrocarbons, please see the enclosed contaminant profiles developed by the Agency for Toxic Substances and Disease Registry (ATSDR).

If you are concerned, please consider some of these options while we evaluate these contaminants in more detail.

- Ensure proper hygiene, especially frequent hand washing.
- Soil should be thoroughly shaken off clothes and footwear, before entering homes.
- Use a dust mask when mowing.
- Limit outside digging and soil moving activities.

We would like to follow-up with you during the week of October 26, 2015, to discuss the data presented in this letter and answer any questions that you may have. We will contact you by phone to schedule a time that fits your schedule. In the interim, should you want to talk with us, please contact me at 214-665-8143, or 1-800-533-3508, or contact Todd Downham, Oklahoma Department of Environmental Quality at 405-702-5136.

Sincerely,

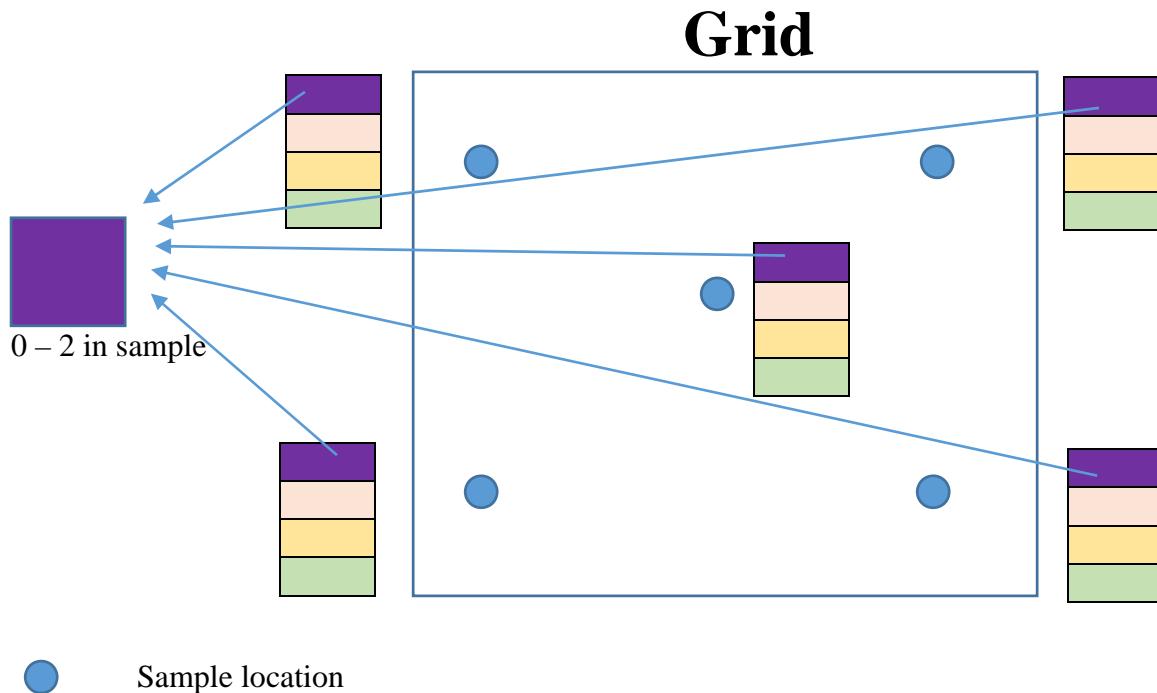


Katrina Higgins-Coltrain,
Remedial Project Manager
LA/OK/NM Section

Enclosure 1: Understanding the Soil Collection Process

The following summary is provided to help you better understand how we sampled your property. The figure provided as Enclosure 2 shows that your property was divided into several sample grids. As shown in Figure 2, each Grid has five sample locations. From each of these five locations, a 24 inch long soil core was taken. The soil core was divided into depth intervals of 0-2 inches below ground surface (bgs), 2-6 inches bgs, 6-12 inches bgs, and 12-24 inches bgs. The soil from each depth interval was combined together to produce one sample representing that depth interval. For example, soil from 0–2 inches bgs was collected from each of the five sample locations and then combined into one sample that represents the 0–2 inch depth interval for that Grid. This process was used for each depth interval and results in a total of 4 soil samples for each Grid. One sample represents the 0–2 inches bgs, the second represents 2–6 inches bgs, the third represents 6–12 inches bgs, and the fourth represents 12–24 inches bgs. Figure 2 shows an example of the sample process. If there is no sample result for a depth interval, then we were not able to collect that sample due to little soil recovery or the core could not be pushed deeper because of rock. The table provided in Enclosure 3 summarizes the data results for all chemicals detected in the soil and provides the full list of chemicals that were analyzed. If a chemical is not summarized, then that chemical was not detected in the soil.

Figure 2: Example of Soil Collection Process



Depths for each Sample Location	
Purple	0 – 2 inches below ground surface (bgs)
Orange	2 – 6 inches bgs
Yellow	6 – 12 inches bgs
Green	12 – 24 inches bgs

Enclosure 2: Figure of Sample Grids

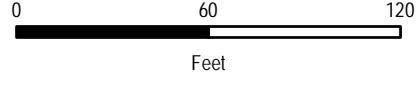


Google™

Imagery ©2015

LEGEND

- Property Boundary
- Sample Grid Location



US EPA REGION 6		
PROPERTY 017 SAMPLE LOCATION MAP WILCOX OIL WEST 221st STREET/REFINERY ROAD BRISTOW, CREEK COUNTY, OKLAHOMA		
DATE OCTOBER, 2015 PROJECT NO 20406.012.005.0919.01 SCALE AS SHOWN		
FILE: L:\20406_START3_R6\WILCOX_OIL\GIS\MXDs\Sample Location Maps\Property 017 - Sample Location Map.mxd	11:35:38 AM 10/2/2015 bond	

Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 1 0-2in bgs 5/20/2015	Grid 1-Sieved 0-2in bgs 6/8/2015	Grid 1 2-6in bgs 5/21/2015	Grid 1-Sieved 2-6in bgs 6/9/2015	Grid 1-Sieved Duplicate 2-6in bgs 6/9/2015	Grid 1 6-12in bgs 5/21/2015
Metals										
Aluminum	7429-90-5	mg/kg	77000	--	1630	3580	2020	3100	3350	3540
Antimony	7440-36-0	mg/kg	31	--	0.6 U	0.92 UJ	0.6 U	0.86 UJ	0.72 UJ	0.5 U
Arsenic	7440-38-2	mg/kg	0.68	--	0.9	2.4	1.5	2	2	2
Barium	7440-39-3	mg/kg	15000	--	29.8	61.9	30.8	51.3	49.3	34.4
Beryllium	7440-41-7	mg/kg	160	--	0.6 U	0.46 U	0.6 U	0.43 U	0.36 U	0.5 U
Cadmium	7440-43-9	mg/kg	71	--	0.6 U	0.46 U	0.6 U	0.43 U	0.36 U	0.5 U
Calcium	7440-70-2	mg/kg	NP	--	779	1960	613	1160	1240	724
Chromium	7440-47-3	mg/kg	NP	--	3	11.3	4.1	9.2	8.3	5.9
Cobalt	7440-48-4	mg/kg	23	--	3.5	3.3	3.5	3.3	3.4	3.7
Copper	7440-50-8	mg/kg	3100	--	8.4	96.8	12.8	26.2	93.7	14.2
Iron	7439-89-6	mg/kg	55000	--	3180	7640	4720	6640	7100	7020
Lead	7439-92-1	mg/kg	400	--	16.3	43.6	14.3	36.2	33.5	9
Magnesium	7439-95-4	mg/kg	NP	--	248	632	212	470	495	304
Manganese	7439-96-5	mg/kg	1800	--	184	194	185	202	238	174
Mercury	7439-97-6	mg/kg	9.4	--	0.071 U	0.018 LJ	0.068 U	0.033 LJ	0.031 LJ	0.076 U
Nickel	7440-02-0	mg/kg	1500	--	2.2 U	6.7	3	5.7	5.2	3.6
Potassium	7440-09-7	mg/kg	NP	--	429	825	336	619	658	371
Selenium	7782-49-2	mg/kg	390	--	1.1 U	2.3 U	1.1 U	2.1 U	1.8 U	1.1 U
Sodium	7440-23-5	mg/kg	NP	--	55 U	388 U	55.1 U	376 U	414 U	53.6 U
Vanadium	7440-62-2	mg/kg	390	--	4.6	14.7	5.4	12.4	11.5	10.3
Zinc	7440-66-6	mg/kg	23000	--	47.6	83.1	49.1	64.9	81	26.1



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 1 0-2in bgs 5/20/2015	Grid 1-Sieved 0-2in bgs 6/8/2015	Grid 1 2-6in bgs 5/21/2015	Grid 1-Sieved 2-6in bgs 6/9/2015	Grid 1-Sieved Duplicate 2-6in bgs 6/9/2015	Grid 1 6-12in bgs 5/21/2015
Polychlorinated Biphenyls										
Aroclor-1260	11096-82-5	mg/kg	0.24	--	0.041 U	NA	0.04 U	NA	NA	0.039 U
Pesticides										
4,4'-DDD	72-54-8	mg/kg	2.3	--	0.0012 L	NA	0.0011 L	NA	NA	0.0013 L
4,4'-DDE	72-55-9	mg/kg	2	--	0.001 L	NA	0.0032 L	NA	NA	0.00076 L
4,4'-DDT	50-29-3	mg/kg	1.9	--	0.0021 L	NA	0.0022 L	NA	NA	0.002 L
alpha-BHC	319-84-6	mg/kg	0.086	--	0.0002 L	NA	0.002 U	NA	NA	0.000074 L
alpha-Chlordane	5103-71-9	mg/kg	NP	--	0.0021 U	NA	0.002 U	NA	NA	0.002 U
beta-BHC	319-85-7	mg/kg	0.3	--	0.0021 U	NA	0.002 U	NA	NA	0.002 U
Carbazole	86-74-8	mg/kg	NP	--	0.051 L	NA	0.071 L	NA	NA	0.2 U
delta-BHC	319-86-8	mg/kg	NP	--	0.0021 U	NA	0.002 U	NA	NA	0.002 U
Dieldrin	60-57-1	mg/kg	0.034	--	0.0041 U	NA	0.004 U	NA	NA	0.0039 U
Endosulfan I	959-98-8	mg/kg	NP	--	0.0021 U	NA	0.002 U	NA	NA	0.002 U
Endosulfan II	33213-65-9	mg/kg	NP	--	0.00017 L	NA	0.004 U	NA	NA	0.0039 U
Endosulfan sulfate	1031-07-8	mg/kg	NP	--	0.00008 L	NA	0.004 U	NA	NA	0.0039 U
Endrin	72-20-8	mg/kg	19	--	0.00044 L	NA	0.000079 L	NA	NA	0.00015 L
Endrin ketone	53494-70-5	mg/kg	NP	--	0.00026 L	NA	0.004 U	NA	NA	0.0039 U
gamma-BHC (Lindane)	58-89-9	mg/kg	0.57	--	0.00079 L	NA	0.00021 L	NA	NA	0.002 U
gamma-Chlordane	5103-74-2	mg/kg	NP	--	0.00024 L	NA	0.002 U	NA	NA	0.002 U
Heptachlor	76-44-8	mg/kg	0.13	--	0.0021 U	NA	0.002 U	NA	NA	0.002 U
Heptachlor epoxide	1024-57-3	mg/kg	0.07	--	0.00032 L	NA	0.00042 L	NA	NA	0.00048 L
Methoxychlor	72-43-5	mg/kg	320	--	0.0008 L	NA	0.0023 L	NA	NA	0.0012 L



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 1 0-2in bgs 5/20/2015	Grid 1-Sieved 0-2in bgs 6/8/2015	Grid 1 2-6in bgs 5/21/2015	Grid 1-Sieved 2-6in bgs 6/9/2015	Grid 1-Sieved Duplicate 2-6in bgs 6/9/2015	Grid 1 6-12in bgs 5/21/2015
Semi-volatile Organic Compounds										
4-Methylphenol	106-44-5	mg/kg	6300	--	0.21 U	NA	0.2 U	NA	NA	0.2 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	NA	NA	0.25	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	0.22	NA	0.24	NA	NA	NA
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	39	--	0.042 LJ	NA	0.059 LJ	NA	NA	0.031 LJ
Chrysene	218-01-9	mg/kg	16	--	NA	NA	0.26	NA	NA	NA
Dibenzofuran	132-64-9	mg/kg	73	--	0.023 LJ	NA	0.2 U	NA	NA	0.2 U
Di-n-butylphthalate	84-74-2	mg/kg	6300	--	0.21 U	NA	0.2 U	NA	NA	0.2 U
Fluoranthene	206-44-0	mg/kg	2400	--	0.28	NA	0.73	NA	NA	NA
Phenanthrene	85-01-8	mg/kg	NP	--	0.25	NA	0.5	NA	NA	NA
Pyrene	129-00-0	mg/kg	1800	--	0.24	NA	0.57	NA	NA	NA
Semi-volatile Organic Compounds (SIM)										
2-Methylnaphthalene	91-57-6	mg/kg	240	--	0.012 LJ	NA	0.12 U	NA	NA	0.00084 LJ
Acenaphthene	83-32-9	mg/kg	3600	--	0.04 LJ	NA	0.043 LJ	NA	NA	0.0039 UJ
Acenaphthylene	208-96-8	mg/kg	NP	--	0.042 U	NA	0.12 U	NA	NA	0.00082 LJ
Anthracene	120-12-7	mg/kg	18000	--	0.061	NA	0.094 LJ	NA	NA	0.0039 UJ
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	0.2	NA	NA	NA	NA	0.0026 LJ
Benzo(a)pyrene	50-32-8	mg/kg	0.016	--	0.17	NA	0.17	NA	NA	0.0021 LJ
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	NA	NA	NA	NA	NA	0.0041 J
Benzo(g,h,i)perylene	191-24-2	mg/kg	NP	--	0.033 LJ	NA	0.087 LJ	NA	NA	0.0017 LJ
Benzo(k)fluoranthene	207-08-9	mg/kg	1.6	--	0.082	NA	0.08 LJ	NA	NA	0.001 LJ
Chrysene	218-01-9	mg/kg	16	--	0.17	NA	NA	NA	NA	0.0034 LJ
Dibenzo(a,h)anthracene	53-70-3	mg/kg	0.016	--	0.028 LJ	NA	0.029 LJ	NA	NA	0.0039 UJ
Fluoranthene	206-44-0	mg/kg	2400	--	NA	NA	NA	NA	NA	0.0035 LJ
Fluorene	86-73-7	mg/kg	2400	--	0.025 LJ	NA	0.027 LJ	NA	NA	0.0039 UJ
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0.16	--	0.14	NA	0.14	NA	NA	0.0026 LJ
Naphthalene	91-20-3	mg/kg	3.8	--	0.048	NA	0.12 U	NA	NA	0.0039 UJ
Pentachlorophenol	87-86-5	mg/kg	1	--	0.085 U	NA	0.24 U	NA	NA	NA
Phenanthrene	85-01-8	mg/kg	NP	--	NA	NA	NA	NA	NA	0.0026 LJ
Pyrene	129-00-0	mg/kg	1800	--	NA	NA	NA	NA	NA	0.0034 LJ



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 1 0-2in bgs	Grid 1-Sieved 0-2in bgs	Grid 1 2-6in bgs	Grid 1-Sieved 2-6in bgs	Grid 1-Sieved Duplicate 2-6in bgs	Grid 1 6-12in bgs
Volatile Organic Compounds										
2-Butanone	78-93-3	mg/kg	27000	--	0.012 U	NA	0.011 U	NA	NA	0.011 U
Acetone	67-64-1	mg/kg	61000	--	0.012 U	NA	0.011 U	NA	NA	0.011 U
Chloroform	67-66-3	mg/kg	0.32	--	0.0062 U	NA	0.0054 U	NA	NA	0.00046 UJ
Methylene chloride	75-09-2	mg/kg	57	--	0.0062 U	NA	0.0054 U	NA	NA	0.0053 U
Toluene	108-88-3	mg/kg	4900	--	0.00066 UJ	NA	0.00022 UJ	NA	NA	0.00062 UJ

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

NA - Not Analyzed

Yellow highlighted cells exceed RSL

NP - Not Published

U - Not Detected at reported quantitation limit

J - Estimated Value

L - Reported concentration is below the CRQL

R - Unusable

mg/kg-milligrams per kilogram

SIM-selected ion monitoring

BOLD-indicates a detected concentration

in-inches

bgs-below ground surface



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 2 0-2in bgs 5/20/2015	Grid 2-Sieved 0-2in bgs 6/10/2015	Grid 2 2-6in bgs 5/21/2015	Grid 2-Sieved 2-6in bgs 6/8/2015	Grid 2 6-12in bgs 5/21/2015	Grid 2 12-24in bgs 5/21/2015
Metals										
Aluminum	7429-90-5	mg/kg	77000	--	2680	3400	3760	3010	6560	7740
Antimony	7440-36-0	mg/kg	31	--	0.6 U	0.86 UJ	0.5 U	0.89 UJ	0.5 U	0.6 U
Arsenic	7440-38-2	mg/kg	0.68	--	2.5	2.1	1.9	2	4.4	3.4
Barium	7440-39-3	mg/kg	15000	--	32.4	45.8	42.6	43.8	57.9	67.1
Beryllium	7440-41-7	mg/kg	160	--	0.6 U	0.43 U	0.5 U	0.45 U	0.6	0.6 U
Cadmium	7440-43-9	mg/kg	71	--	0.6 U	0.43 U	0.5 U	0.45 U	0.5 U	0.6 U
Calcium	7440-70-2	mg/kg	NP	--	1280	1620	892	1090	1060	1510
Chromium	7440-47-3	mg/kg	NP	--	7.2	9.7	7.3	9.1	13.8	13.1
Cobalt	7440-48-4	mg/kg	23	--	5.5	2.6	3.4	2.3	3.8	3.4
Copper	7440-50-8	mg/kg	3100	--	7.9	19.7	8.2	104	15.4	19.9
Iron	7439-89-6	mg/kg	55000	--	7400	7630	7050	6460	14600	12500
Lead	7439-92-1	mg/kg	400	--	11.6	22.8	13.5	19.7	6.3	8.6
Magnesium	7439-95-4	mg/kg	NP	--	872	594	664	417	885	1290
Manganese	7439-96-5	mg/kg	1800	--	189	134	86.2	119	47	33.3
Mercury	7439-97-6	mg/kg	9.4	--	0.076 U	0.033 LJ	0.077 U	0.053 LJ	0.08 U	0.079 U
Nickel	7440-02-0	mg/kg	1500	--	13.5	6.6	6.9	5.3	8.8	8.4
Potassium	7440-09-7	mg/kg	NP	--	920	761	512	549	612	816
Selenium	7782-49-2	mg/kg	390	--	1.2 U	2.2 U	1.1 U	2.2 U	1.1 U	1.1 U
Sodium	7440-23-5	mg/kg	NP	--	57.8 U	417 U	54.4 U	390 U	76.3	128
Vanadium	7440-62-2	mg/kg	390	--	8.5	13.7	9.1	13.7	21.4	18.4
Zinc	7440-66-6	mg/kg	23000	--	35.1	63.7	32.2	76.2	12.4	12.3



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 2 0-2in bgs	Grid 2-Sieved 0-2in bgs	Grid 2 2-6in bgs	Grid 2-Sieved 2-6in bgs	Grid 2 6-12in bgs	Grid 2 12-24in bgs
Polychlorinated Biphenyls										
Aroclor-1260	11096-82-5	mg/kg	0.24	--	0.042 U	NA	0.04 U	NA	0.039 U	0.039 U
Pesticides										
4,4'-DDD	72-54-8	mg/kg	2.3	--	0.0042 U	NA	0.00022 LJ	NA	0.0039 U	0.0039 U
4,4'-DDE	72-55-9	mg/kg	2	--	0.0011 LJ	NA	0.0037 LJ	NA	0.00022 LJ	0.00039 LJ
4,4'-DDT	50-29-3	mg/kg	1.9	--	0.0013 LJ	NA	0.003 LJ	NA	0.00023 LJ	0.00026 LJ
alpha-BHC	319-84-6	mg/kg	0.086	--	0.000042 LJ	NA	0.0021 U	NA	0.000024 LJ	0.002 U
alpha-Chlordane	5103-71-9	mg/kg	NP	--	0.0022 U	NA	0.0021 U	NA	0.002 U	0.002 U
beta-BHC	319-85-7	mg/kg	0.3	--	0.00083 LJ	NA	0.0021 U	NA	0.002 U	0.002 U
Carbazole	86-74-8	mg/kg	NP	--	0.22 U	NA	0.21 U	NA	0.2 U	0.2 U
delta-BHC	319-86-8	mg/kg	NP	--	0.0022 U	NA	0.0021 U	NA	0.002 U	0.002 U
Dieldrin	60-57-1	mg/kg	0.034	--	0.0042 U	NA	0.004 U	NA	0.0039 U	0.0039 U
Endosulfan I	959-98-8	mg/kg	NP	--	0.0022 U	NA	0.0021 U	NA	0.002 U	0.002 U
Endosulfan II	33213-65-9	mg/kg	NP	--	0.00003 LJ	NA	0.004 U	NA	0.0039 U	0.0039 U
Endosulfan sulfate	1031-07-8	mg/kg	NP	--	0.000053 LJ	NA	0.004 U	NA	0.0039 U	0.0039 U
Endrin	72-20-8	mg/kg	19	--	0.0042 U	NA	0.004 U	NA	0.00061 LJ	0.00057 LJ
Endrin ketone	53494-70-5	mg/kg	NP	--	0.00018 LJ	NA	0.004 U	NA	0.0039 U	0.0039 U
gamma-BHC (Lindane)	58-89-9	mg/kg	0.57	--	0.00055 LJ	NA	0.00011 LJ	NA	0.000015 LJ	0.000053 LJ
gamma-Chlordane	5103-74-2	mg/kg	NP	--	0.00018 LJ	NA	0.0021 U	NA	0.002 U	0.002 U
Heptachlor	76-44-8	mg/kg	0.13	--	0.0022 U	NA	0.0021 U	NA	0.002 U	0.002 U
Heptachlor epoxide	1024-57-3	mg/kg	0.07	--	0.00013 LJ	NA	0.0021 U	NA	0.002 U	0.002 U
Methoxychlor	72-43-5	mg/kg	320	--	0.0013 LJ	NA	0.00072 LJ	NA	0.0013 LJ	0.00023 LJ



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 2 0-2in bgs 5/20/2015	Grid 2-Sieved 0-2in bgs 6/10/2015	Grid 2 2-6in bgs 5/21/2015	Grid 2-Sieved 2-6in bgs 6/8/2015	Grid 2 6-12in bgs 5/21/2015	Grid 2 12-24in bgs 5/21/2015
Semi-volatile Organic Compounds										
4-Methylphenol	106-44-5	mg/kg	6300	--	0.22 U	NA	0.21 U	NA	0.2 U	0.2 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	39	--	0.029 LJ	NA	0.21 U	NA	0.2 U	0.018 LJ
Chrysene	218-01-9	mg/kg	16	--	NA	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	mg/kg	73	--	0.22 U	NA	0.21 U	NA	0.2 U	0.2 U
Di-n-butylphthalate	84-74-2	mg/kg	6300	--	0.22 U	NA	0.21 U	NA	0.2 U	0.2 U
Fluoranthene	206-44-0	mg/kg	2400	--	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	mg/kg	NP	--	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	mg/kg	1800	--	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (SIM)										
2-Methylnaphthalene	91-57-6	mg/kg	240	--	0.0043 UJ	NA	0.00082 LJ	NA	0.0008 LJ	0.0039 U
Acenaphthene	83-32-9	mg/kg	3600	--	0.0043 UJ	NA	0.0041 U	NA	0.0039 U	0.01
Acenaphthylene	208-96-8	mg/kg	NP	--	0.0039 LJ	NA	0.002 LJ	NA	0.0039 U	0.0039 U
Anthracene	120-12-7	mg/kg	18000	--	0.004 LJ	NA	0.002 LJ	NA	0.0039 U	0.0039 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	0.01 J	NA	0.0079	NA	0.0012 LJ	0.0023 LJ
Benzo(a)pyrene	50-32-8	mg/kg	0.016	--	0.008 J	NA	0.006	NA	0.0039 U	0.0017 LJ
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	0.019 J	NA	0.012	NA	0.0014 LJ	0.0032 LJ
Benzo(g,h,i)perylene	191-24-2	mg/kg	NP	--	0.0018 LJ	NA	0.0041	NA	0.0039 U	0.0015 LJ
Benzo(k)fluoranthene	207-08-9	mg/kg	1.6	--	0.0056 J	NA	0.0033 LJ	NA	0.0039 U	0.00097 LJ
Chrysene	218-01-9	mg/kg	16	--	0.014 J	NA	0.01	NA	0.0012 LJ	0.0031 LJ
Dibenzo(a,h)anthracene	53-70-3	mg/kg	0.016	--	0.0023 LJ	NA	0.0015 LJ	NA	0.0039 U	0.0039 U
Fluoranthene	206-44-0	mg/kg	2400	--	0.015 J	NA	0.0096	NA	0.0015 LJ	0.0031 LJ
Fluorene	86-73-7	mg/kg	2400	--	0.0043 UJ	NA	0.0041 U	NA	0.0039 U	0.0039 U
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0.16	--	0.01 J	NA	0.0069	NA	0.0039 U	0.0019 LJ
Naphthalene	91-20-3	mg/kg	3.8	--	0.0043 UJ	NA	0.0012 LJ	NA	0.00085 LJ	0.0039 U
Pentachlorophenol	87-86-5	mg/kg	1	--	NA	NA	0.001 LJ	NA	0.0079 U	0.0034 LJ
Phenanthrene	85-01-8	mg/kg	NP	--	0.0044 J	NA	0.0031 LJ	NA	0.0011 LJ	0.0016 LJ
Pyrene	129-00-0	mg/kg	1800	--	0.015 J	NA	0.012	NA	0.0015 LJ	0.0065



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 2 0-2in bgs	Grid 2-Sieved 0-2in bgs	Grid 2 2-6in bgs	Grid 2-Sieved 2-6in bgs	Grid 2 6-12in bgs	Grid 2 12-24in bgs
Volatile Organic Compounds										
2-Butanone	78-93-3	mg/kg	27000	--	0.015 U	NA	0.0075 LJ	NA	0.0098 U	0.0088 U
Acetone	67-64-1	mg/kg	61000	--	0.015 U	NA	0.011 U	NA	0.0098 U	0.0088 U
Chloroform	67-66-3	mg/kg	0.32	--	0.00064 LJ	NA	0.0055 U	NA	0.0049 U	0.0044 U
Methylene chloride	75-09-2	mg/kg	57	--	0.0077 U	NA	0.0055 U	NA	0.0049 U	0.0044 U
Toluene	108-88-3	mg/kg	4900	--	0.0016 LJ	NA	0.0055 U	NA	0.00016 LJ	0.0044 U

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

NA - Not Analyzed

Yellow highlighted cells exceed RSL

NP - Not Published

U - Not Detected at reported quantitation limit

J - Estimated Value

L - Reported concentration is below the CRQL

R - Unusable

mg/kg-milligrams per kilogram

SIM-selected ion monitoring

BOLD-Indicates a detected concentration

in-inches

bgs-below ground surface



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 3 0-2in bgs 5/20/2015	Grid 3-Sieved 0-2in bgs 6/10/2015	Grid 3-Sieved Duplicate 0-2in bgs 5/20/2015	Grid 3 2-6in bgs 5/21/2015	Grid 3-Sieved 2-6in bgs 6/10/2015	Grid 3 6-12in bgs 5/21/2015	Grid 3-Duplicate 6-12in bgs 5/21/2015	Grid 3 12-24in bgs 5/21/2015
Metals												
Aluminum	7429-90-5	mg/kg	77000	--	1340	2910	1510	1820	3560	1500	1450	5090
Antimony	7440-36-0	mg/kg	31	--	0.6 U	0.81 UJ	0.6 U	0.5 U	0.78 UJ	0.9	0.5 U	0.6 U
Arsenic	7440-38-2	mg/kg	0.68	--	0.9	1.8	1.3	1.8	1.8	1.5	0.9	1.5
Barium	7440-39-3	mg/kg	15000	--	34.8	62.8	37.1	32.2	59.6	22.6	21.9	29
Beryllium	7440-41-7	mg/kg	160	--	0.6 U	0.4 U	0.6 U	0.5 U	0.39 U	0.5 U	0.5 U	0.6 U
Cadmium	7440-43-9	mg/kg	71	--	0.6 U	0.4 U	0.6 U	0.5 U	0.39 U	0.5 U	0.5 U	0.6 U
Calcium	7440-70-2	mg/kg	NP	--	971	1990	865	1110	1970	441	437	716
Chromium	7440-47-3	mg/kg	NP	--	2.9	8.5	4	5.5	8.2	3.4	2.4	6.5
Cobalt	7440-48-4	mg/kg	23	--	2.6	3.6	2.8	2.7	3.5	4.9	4.2	2.8
Copper	7440-50-8	mg/kg	3100	--	12.8	77.4	13.3	13.9	33.7	7.6	6.6	10.1
Iron	7439-89-6	mg/kg	55000	--	2920	6070	4690	5420	6510	3840	2810	5320
Lead	7439-92-1	mg/kg	400	--	26.4	38.9	29.5	23.2	38.5	9.3	11.3	10
Magnesium	7439-95-4	mg/kg	NP	--	257	538	241	221	569	177	160	480
Manganese	7439-96-5	mg/kg	1800	--	170	235	184	128	250	165	147	88.1
Mercury	7439-97-6	mg/kg	9.4	--	0.085 U	0.047 LJ	0.08 U	0.077 U	0.052 LJ	0.074 U	0.069 U	0.074 U
Nickel	7440-02-0	mg/kg	1500	--	2.3 U	5.3	2.2 U	2.3	5.2	2.1 U	2.1 U	3.9
Potassium	7440-09-7	mg/kg	NP	--	330	642	348	279	682	244	226	619
Selenium	7782-49-2	mg/kg	390	--	1.1 U	0.24 LJ	1.1 U	1.1 U	0.27 LJ	1 U	1 U	1.1 U
Sodium	7440-23-5	mg/kg	NP	--	56.5 U	390 U	55.5 U	53.5 U	498 U	51.3 U	52.4 U	195
Vanadium	7440-62-2	mg/kg	390	--	4.1	12.4	5.3	7	11.8	5.4	3.4	9.4
Zinc	7440-66-6	mg/kg	23000	--	70.9	127	79.5	64.9	110 J	40.7	35.8	29.9



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 3 0-2in bgs	Grid 3-Sieved 0-2in bgs	Grid 3-Sieved Duplicate 0-2in bgs	Grid 3 2-6in bgs	Grid 3-Sieved 2-6in bgs	Grid 3 6-12in bgs	Grid 3-Duplicate 6-12in bgs	Grid 3 12-24in bgs
Polychlorinated Biphenyls												
Aroclor-1260	11096-82-5	mg/kg	0.24	--	0.042 U	NA	0.042 U	0.042 U	NA	0.038 U	0.037 U	0.039 U
Pesticides												
4,4'-DDD	72-54-8	mg/kg	2.3	--	0.0012 LJ	NA	0.0011 LJ	0.00091 LJ	NA	0.00083 LJ	0.00019 LJ	0.00045 LJ
4,4'-DDE	72-55-9	mg/kg	2	--	0.0052	NA	0.0033 LJ	0.0029 LJ	NA	0.0025 LJ	0.0029 LJ	0.0025 LJ
4,4'-DDT	50-29-3	mg/kg	1.9	--	0.0038 LJ	NA	0.0068	0.0021 LJ	NA	0.0012 LJ	0.0032 LJ	0.0013 LJ
alpha-BHC	319-84-6	mg/kg	0.086	--	0.0002 LJ	NA	0.00011 LJ	0.0022 U	NA	0.0019 U	0.0019 U	0.002 U
alpha-Chlordane	5103-71-9	mg/kg	NP	--	0.0022 U	NA	0.0021 U	0.0022 U	NA	0.0019 U	0.0019 U	0.002 U
beta-BHC	319-85-7	mg/kg	0.3	--	0.0022 U	NA	0.0021 U	0.0022 U	NA	0.0019 U	0.0019 U	0.002 U
Carbazole	86-74-8	mg/kg	NP	--	0.22 U	NA	0.22 U	0.22 U	NA	0.19 U	0.19 U	0.2 U
delta-BHC	319-86-8	mg/kg	NP	--	0.0022 U	NA	0.0021 U	0.0022 U	NA	0.0019 U	0.0019 U	0.002 U
Dieldrin	60-57-1	mg/kg	0.034	--	0.0042 U	NA	0.0042 U	0.0042 U	NA	0.0038 U	0.0037 U	0.0039 U
Endosulfan I	959-98-8	mg/kg	NP	--	0.0022 U	NA	0.0021 U	0.0022 U	NA	0.0019 U	0.0019 U	0.002 U
Endosulfan II	33213-65-9	mg/kg	NP	--	0.0011 LJ	NA	0.00027 LJ	0.0042 U	NA	0.0038 U	0.0037 U	0.0039 U
Endosulfan sulfate	1031-07-8	mg/kg	NP	--	0.000087 LJ	NA	0.00008 LJ	0.00014 LJ	NA	0.0038 U	0.0037 U	0.0039 U
Endrin	72-20-8	mg/kg	19	--	0.0042 U	NA	0.00059 LJ	0.0042 U	NA	0.0038 U	0.0037 U	0.0039 U
Endrin ketone	53494-70-5	mg/kg	NP	--	0.00032 LJ	NA	0.0004 LJ	0.0042 U	NA	0.0038 U	0.0037 U	0.0039 U
gamma-BHC (Lindane)	58-89-9	mg/kg	0.57	--	0.002 LJ	NA	0.0013 LJ	0.000019 LJ	NA	0.0019 U	0.000064 LJ	0.002 U
gamma-Chlordane	5103-74-2	mg/kg	NP	--	0.00066 LJ	NA	0.0008 LJ	0.0022 U	NA	0.0019 U	0.0019 U	0.002 U
Heptachlor	76-44-8	mg/kg	0.13	--	0.0022 U	NA	0.00029 LJ	0.0022 U	NA	0.0019 U	0.0019 U	0.002 U
Heptachlor epoxide	1024-57-3	mg/kg	0.07	--	0.00035 LJ	NA	0.0021 U	0.0022 U	NA	0.0019 U	0.0019 U	0.002 U
Methoxychlor	72-43-5	mg/kg	320	--	0.001 LJ	NA	0.00097 LJ	0.00027 LJ	NA	0.00091 LJ	0.00058 LJ	0.02 U



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 3 0-2in bgs 5/20/2015	Grid 3-Sieved 0-2in bgs 6/10/2015	Grid 3-Sieved Duplicate 0-2in bgs 5/20/2015	Grid 3 2-6in bgs 5/21/2015	Grid 3-Sieved 2-6in bgs 6/10/2015	Grid 3 6-12in bgs 5/21/2015	Grid 3-Duplicate 6-12in bgs 5/21/2015	Grid 3 12-24in bgs 5/21/2015
Semi-volatile Organic Compounds												
4-Methylphenol	106-44-5	mg/kg	6300	--	0.22 U	NA	0.039 LJ	0.22 U	NA	0.19 U	0.19 U	0.2 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	39	--	0.025 LJ	NA	0.18 LJ	0.022 LJ	NA	0.032 LJ	0.026 LJ	0.2 U
Chrysene	218-01-9	mg/kg	16	--	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	mg/kg	73	--	0.22 U	NA	0.22 U	0.22 U	NA	0.19 U	0.19 U	0.2 U
Di-n-butylphthalate	84-74-2	mg/kg	6300	--	0.22 U	NA	0.22 U	0.22 U	NA	0.19 U	0.19 U	0.2 U
Fluoranthene	206-44-0	mg/kg	2400	--	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	mg/kg	NP	--	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	mg/kg	1800	--	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (SIM)												
2-Methylnaphthalene	91-57-6	mg/kg	240	--	0.0042 UJ	NA	0.0012 LJ	0.0042 UJ	NA	0.00084 LJ	0.0037 U	0.0039 U
Acenaphthene	83-32-9	mg/kg	3600	--	0.0042 UJ	NA	0.0042 UJ	0.0042 UJ	NA	0.0037 U	0.0014 LJ	0.0039 U
Acenaphthylene	208-96-8	mg/kg	NP	--	0.0023 LJ	NA	0.0022 LJ	0.0017 LJ	NA	0.0012 LJ	0.0013 LJ	0.0039 U
Anthracene	120-12-7	mg/kg	18000	--	0.0027 LJ	NA	0.0029 LJ	0.0027 LJ	NA	0.0017 LJ	0.0012 LJ	0.0039 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	0.009 J	NA	0.0095 J	0.0094 J	NA	0.0091	0.0052	0.0039
Benzo(a)pyrene	50-32-8	mg/kg	0.016	--	0.0083 J	NA	0.0085 J	0.0073 J	NA	0.0061	0.0046	0.0034 LJ
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	0.015 J	NA	0.017 J	0.013 J	NA	0.0092	0.0097	0.0054
Benzo(g,h,i)perylene	191-24-2	mg/kg	NP	--	0.0021 LJ	NA	0.0019 LJ	0.0065 J	NA	0.0051	0.0027 LJ	0.0017 LJ
Benzo(k)fluoranthene	207-08-9	mg/kg	1.6	--	0.0043 J	NA	0.0045 J	0.0033 LJ	NA	0.0022 LJ	0.0024 LJ	0.0013 LJ
Chrysene	218-01-9	mg/kg	16	--	0.011 J	NA	0.012 J	0.012 J	NA	0.016	0.0064	0.005
Dibenzo(a,h)anthracene	53-70-3	mg/kg	0.016	--	0.0021 LJ	NA	0.0022 LJ	0.0019 LJ	NA	0.0017 LJ	0.0011 LJ	0.0039 U
Fluoranthene	206-44-0	mg/kg	2400	--	0.01 J	NA	0.011 J	0.012 J	NA	0.0064	0.0042	0.004
Fluorene	86-73-7	mg/kg	2400	--	0.0042 UJ	NA	0.0042 UJ	0.0042 UJ	NA	0.0037 U	0.0037 U	0.0039 U
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0.16	--	0.0082 J	NA	0.0084 J	0.0078 J	NA	0.0055	0.0047	0.0027 LJ
Naphthalene	91-20-3	mg/kg	3.8	--	0.0042 UJ	NA	0.0012 LJ	0.0042 UJ	NA	0.0037 U	0.0037 U	0.0039 U
Pentachlorophenol	87-86-5	mg/kg	1	--	NA	NA	NA	NA	NA	0.0076 U	0.0075 U	0.0078 U
Phenanthrene	85-01-8	mg/kg	NP	--	0.0029 LJ	NA	0.0038 LJ	0.0092 J	NA	0.01	0.0016 LJ	0.0013 LJ
Pyrene	129-00-0	mg/kg	1800	--	0.012 J	NA	0.012 J	0.014 J	NA	0.014	0.006	0.0045



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 3 0-2in bgs	Grid 3-Sieved 0-2in bgs	Grid 3-Sieved Duplicate 0-2in bgs	Grid 3 2-6in bgs	Grid 3-Sieved 2-6in bgs	Grid 3 6-12in bgs	Grid 3-Duplicate 6-12in bgs	Grid 3 12-24in bgs
Volatile Organic Compounds												
2-Butanone	78-93-3	mg/kg	27000	--	0.015 U	NA	0.0059 LJ	0.014	NA	0.012 U	0.011 U	0.015
Acetone	67-64-1	mg/kg	61000	--	0.012 LJ	NA	0.024	0.032	NA	0.012 U	0.011 U	0.011 UM
Chloroform	67-66-3	mg/kg	0.32	--	0.0075 U	NA	0.0068 U	0.0056 U	NA	0.0058 U	0.0056 U	0.0057 U
Methylene chloride	75-09-2	mg/kg	57	--	0.0005 LJ	NA	0.00059 LJ	0.0056 U	NA	0.0058 U	0.0056 U	0.0057 U
Toluene	108-88-3	mg/kg	4900	--	0.0023 LJ	NA	0.00093 LJ	0.00042 LJ	NA	0.00047 LJ	0.00041 LJ	0.00084 LJ

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL NA - Not Analyzed

Yellow highlighted cells exceed RSL NP - Not Published

U - Not Detected at reported quantitation limit J - Estimated Value

L - Reported concentration is below the CRQL R - Unusable

mg/kg-milligrams per kilogram SIM-selected ion monitoring

BOLD-indicates a detected concentration in-inches

bgs-below ground surface



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 4 0-2in bgs	Grid 4-Sieved 0-2in bgs	Grid 4 2-6in bgs	Grid 4-Sieved 2-6in bgs	Grid 4 6-12in bgs	Grid 4 12-24in bgs
Metals										
Aluminum	7429-90-5	mg/kg	77000	--	1270	2930	1770	3100	2400	2690
Antimony	7440-36-0	mg/kg	31	--	0.6 U	0.94 UJ	0.5 UJ, U	0.95 UJ	0.5 U	0.5 U
Arsenic	7440-38-2	mg/kg	0.68	--	0.8	1.4	1.4	1.4	2.6	1.2
Barium	7440-39-3	mg/kg	15000	--	32.2	60.4	26.2	49.9	30.8	19.9
Beryllium	7440-41-7	mg/kg	160	--	0.6 U	0.47 U	0.5 U	0.47 U	0.5 U	0.5 U
Cadmium	7440-43-9	mg/kg	71	--	0.9	0.47 U	0.5 U	0.47 U	0.5 U	0.5 U
Calcium	7440-70-2	mg/kg	NP	--	914	1980	1310	1510	7710	487
Chromium	7440-47-3	mg/kg	NP	--	3.4	7.5	3.7	6.6	3.8	2.9
Cobalt	7440-48-4	mg/kg	23	--	2.2 U	2.2	2.1 U	2	2.8	3
Copper	7440-50-8	mg/kg	3100	--	6.9	108	7.8	18.3	3.7	2.5
Iron	7439-89-6	mg/kg	55000	--	4570	5340	4520	4930	3450	4050
Lead	7439-92-1	mg/kg	400	--	20.3	46.9	22.7	39.1	9.4	6
Magnesium	7439-95-4	mg/kg	NP	--	237	601	309	523	285	242
Manganese	7439-96-5	mg/kg	1800	--	109	176	94 J	139	136	70.5
Mercury	7439-97-6	mg/kg	9.4	--	0.073 U	0.093 LJ	0.079 U	0.07 LJ	0.07 U	0.07 U
Nickel	7440-02-0	mg/kg	1500	--	2.7	5.3	3	4.3	3.1	2.1 U
Potassium	7440-09-7	mg/kg	NP	--	287	553	327	497	322	325
Selenium	7782-49-2	mg/kg	390	--	1.1 U	2.4 U	1.1 U	2.4 U	1 U	1 U
Sodium	7440-23-5	mg/kg	NP	--	55.4 U	410 U	53.6 U	371 U	52.2 U	52.3 U
Vanadium	7440-62-2	mg/kg	390	--	4.5	10.3	4.4	9.7	8.1	5.4
Zinc	7440-66-6	mg/kg	23000	--	78.2	153	57.4	100 J	33.2	24.4



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 4 0-2in bgs	Grid 4-Sieved 0-2in bgs	Grid 4 2-6in bgs	Grid 4-Sieved 2-6in bgs	Grid 4 6-12in bgs	Grid 4 12-24in bgs
Polychlorinated Biphenyls										
Aroclor-1260	11096-82-5	mg/kg	0.24	--	0.04 U	NA	0.1	NA	0.037 U	0.037 U
Pesticides										
4,4'-DDD	72-54-8	mg/kg	2.3	--	0.0054 J	NA	0.0085 J	NA	0.0054	0.00075 U
4,4'-DDE	72-55-9	mg/kg	2	--	0.0021 UJ	NA	0.0039 J	NA	0.0016 UJ	0.00013 UJ
4,4'-DDT	50-29-3	mg/kg	1.9	--	0.0051	NA	0.01 J	NA	0.0016 UJ	0.0013 UJ
alpha-BHC	319-84-6	mg/kg	0.086	--	0.002 U	NA	0.000058 UJ	NA	0.000044 UJ	0.0019 U
alpha-Chlordane	5103-71-9	mg/kg	NP	--	0.0025 J	NA	0.0095 J	NA	0.0088 J	0.000077 UJ
beta-BHC	319-85-7	mg/kg	0.3	--	0.0017 UJ	NA	0.002 U	NA	0.0019 U	0.0019 U
Carbazole	86-74-8	mg/kg	NP	--	0.61 U	NA	0.2 U	NA	0.19 U	0.19 U
delta-BHC	319-86-8	mg/kg	NP	--	0.0022	NA	0.002 U	NA	0.0019 U	0.0019 U
Dieldrin	60-57-1	mg/kg	0.034	--	0.004 U	NA	0.0039 U	NA	0.0037 U	0.0037 U
Endosulfan I	959-98-8	mg/kg	NP	--	0.002 U	NA	0.002 U	NA	0.0019 U	0.0019 U
Endosulfan II	33213-65-9	mg/kg	NP	--	0.0013 UJ	NA	0.0039 U	NA	0.0037 U	0.0037 U
Endosulfan sulfate	1031-07-8	mg/kg	NP	--	0.004 U	NA	0.00019 UJ	NA	0.0003 UJ	0.0037 U
Endrin	72-20-8	mg/kg	19	--	0.0014 UJ	NA	0.00096 UJ	NA	0.0016 UJ	0.0037 U
Endrin ketone	53494-70-5	mg/kg	NP	--	0.0012 UJ	NA	0.0039 U	NA	0.0037 U	0.0037 U
gamma-BHC (Lindane)	58-89-9	mg/kg	0.57	--	0.0015 UJ	NA	0.00027 UJ	NA	0.00011 UJ	0.0019 U
gamma-Chlordane	5103-74-2	mg/kg	NP	--	0.0035 J	NA	0.016 J	NA	0.013 J	0.0019 U
Heptachlor	76-44-8	mg/kg	0.13	--	0.00086 UJ	NA	0.0031	NA	0.0019 U	0.0019 U
Heptachlor epoxide	1024-57-3	mg/kg	0.07	--	0.0017 UJ	NA	0.008	NA	0.0099	0.0011 UJ
Methoxychlor	72-43-5	mg/kg	320	--	0.00088 UJ	NA	0.02 U	NA	0.019 U	0.019 U



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 4 0-2in bgs 5/20/2015	Grid 4-Sieved 0-2in bgs 6/9/2015	Grid 4 2-6in bgs 5/21/2015	Grid 4-Sieved 2-6in bgs 6/10/2015	Grid 4 6-12in bgs 5/21/2015	Grid 4 12-24in bgs 5/21/2015
Semi-volatile Organic Compounds										
4-Methylphenol	106-44-5	mg/kg	6300	--	0.61 U	NA	0.2 U	NA	0.19 U	0.19 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	39	--	0.068 LJ	NA	0.034 LJ	NA	0.19 U	0.19 U
Chrysene	218-01-9	mg/kg	16	--	NA	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	mg/kg	73	--	0.61 U	NA	0.2 U	NA	0.19 U	0.19 U
Di-n-butylphthalate	84-74-2	mg/kg	6300	--	0.61 U	NA	0.2 U	NA	0.19 U	0.19 U
Fluoranthene	206-44-0	mg/kg	2400	--	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	mg/kg	NP	--	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	mg/kg	1800	--	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (SIM)										
2-Methylnaphthalene	91-57-6	mg/kg	240	--	0.012 UJ	NA	0.001 LJ	NA	0.0037 U	0.0037 U
Acenaphthene	83-32-9	mg/kg	3600	--	0.012 UJ	NA	0.00096 LJ	NA	0.0037 U	0.0037 U
Acenaphthylene	208-96-8	mg/kg	NP	--	0.012 J	NA	0.0035 LJ	NA	0.0012 LJ	0.0037 U
Anthracene	120-12-7	mg/kg	18000	--	0.014 J	NA	0.005 J	NA	0.0013 LJ	0.0037 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	0.027 J	NA	0.011 J	NA	0.0038	0.0011 LJ
Benzo(a)pyrene	50-32-8	mg/kg	0.016	--	0.02 J	NA	0.009 J	NA	0.0029 LJ	0.00091 LJ
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	0.065 J	NA	0.023 J	NA	0.0076	0.0016 LJ
Benzo(g,h,i)perylene	191-24-2	mg/kg	NP	--	0.0046 LJ	NA	0.0021 LJ	NA	0.0037 U	0.0037 U
Benzo(k)fluoranthene	207-08-9	mg/kg	1.6	--	0.015 J	NA	0.0055 J	NA	0.0023 LJ	0.0037 U
Chrysene	218-01-9	mg/kg	16	--	0.042 J	NA	0.016 J	NA	0.0056	0.0012 LJ
Dibenzo(a,h)anthracene	53-70-3	mg/kg	0.016	--	0.0062 LJ	NA	0.0032 LJ	NA	0.001 LJ	0.0037 U
Fluoranthene	206-44-0	mg/kg	2400	--	0.04 J	NA	0.011 J	NA	0.0031 LJ	0.0012 LJ
Fluorene	86-73-7	mg/kg	2400	--	0.012 UJ	NA	0.0038 UJ	NA	0.0037 U	0.0037 U
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0.16	--	0.028 J	NA	0.014 J	NA	0.0047	0.00094 LJ
Naphthalene	91-20-3	mg/kg	3.8	--	0.012 UJ	NA	0.0038 UJ	NA	0.0037 U	0.0037 U
Pentachlorophenol	87-86-5	mg/kg	1	--	NA	NA	NA	NA	0.0075 U	0.0076 U
Phenanthrene	85-01-8	mg/kg	NP	--	0.012 J	NA	0.0045 J	NA	0.0012 LJ	0.0037 U
Pyrene	129-00-0	mg/kg	1800	--	0.035 J	NA	0.012 J	NA	0.0049	0.0012 LJ



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 4 0-2in bgs	Grid 4-Sieved 0-2in bgs	Grid 4 2-6in bgs	Grid 4-Sieved 2-6in bgs	Grid 4 6-12in bgs	Grid 4 12-24in bgs
Volatile Organic Compounds										
2-Butanone	78-93-3	mg/kg	27000	--	0.011 U	NA	0.012 U	NA	0.0087 U	0.023
Acetone	67-64-1	mg/kg	61000	--	0.011	NA	0.012 UM	NA	0.0087 U	0.049
Chloroform	67-66-3	mg/kg	0.32	--	0.0053 U	NA	0.0058 U	NA	0.00044 LJ	0.00044 LJ
Methylene chloride	75-09-2	mg/kg	57	--	0.00042 LJ	NA	0.0058 U	NA	0.0043 U	0.0047 U
Toluene	108-88-3	mg/kg	4900	--	0.00052 LJ	NA	0.0023 LJ	NA	0.0007 LJ	0.002 LJ

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

NA - Not Analyzed

Yellow highlighted cells exceed RSL

NP - Not Published

U - Not Detected at reported quantitation limit

J - Estimated Value

L - Reported concentration is below the CRQL

R - Unusable

mg/kg-milligrams per kilogram

SIM-selected ion monitoring

BOLD-Indicates a detected concentration

in-inches

bgs-below ground surface



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 5 0-2in bgs 5/20/2015	Grid 5-Sieved 0-2in bgs 6/11/2015	Grid 5 2-6in bgs 5/20/2015	Grid 5-Sieved 2-6in bgs 6/10/2015	Grid 5 6-12in bgs 5/20/2015	Grid 5 12-24in bgs 5/20/2015
Metals										
Aluminum	7429-90-5	mg/kg	77000	--	1580	2810	1640	3460	1250	5650
Antimony	7440-36-0	mg/kg	31	--	0.6 UJ	0.91 UJ	0.5 U	0.94 UJ	0.5 U	0.6 U
Arsenic	7440-38-2	mg/kg	0.68	--	1.5	3	1.5	3.4	0.8	2
Barium	7440-39-3	mg/kg	15000	--	27.4	43.3	25.2	45.6	18	21.8
Beryllium	7440-41-7	mg/kg	160	--	0.6 U	0.45 U	0.5 U	0.47 U	0.5 U	0.6 U
Cadmium	7440-43-9	mg/kg	71	--	0.6 U	0.45 U	0.5 U	0.47 U	0.5 U	0.6 U
Calcium	7440-70-2	mg/kg	NP	--	918	6540	774	6610	431	540
Chromium	7440-47-3	mg/kg	NP	--	3.1	7.3	4.5	8.4	2.4	7.6
Cobalt	7440-48-4	mg/kg	23	--	2.3 U	2.6	2.2 U	3.2	2.1 U	2.2 U
Copper	7440-50-8	mg/kg	3100	--	6.3	41.1	5.4	24.9	3.1	7.1
Iron	7439-89-6	mg/kg	55000	--	3220	6500	3630	7310	2280	8660
Lead	7439-92-1	mg/kg	400	--	18.9	24.2	15.8	27	8.1	3.7
Magnesium	7439-95-4	mg/kg	NP	--	286	3030	252	3260	165	374
Manganese	7439-96-5	mg/kg	1800	--	161 J	289	147	309	106	36.5
Mercury	7439-97-6	mg/kg	9.4	--	0.077 U	0.032 LJ	0.078 U	0.039 LJ	0.077 U	0.078 U
Nickel	7440-02-0	mg/kg	1500	--	2.3 U	4.5	2.2 U	5.1	2.1 U	2.6
Potassium	7440-09-7	mg/kg	NP	--	326	579	295	572	204	477
Selenium	7782-49-2	mg/kg	390	--	1.1 UJ, U	2.3 U	1.1 U	2.3 U	1.1 U	1.1 U
Sodium	7440-23-5	mg/kg	NP	--	57 U	408 U	54.9 U	374 U	52.6 U	55.6 U
Vanadium	7440-62-2	mg/kg	390	--	4.8	11.2	6.2	13.2	4	14.4
Zinc	7440-66-6	mg/kg	23000	--	55.2	65 J	41.8	68.3	19.3	7.1



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 5 0-2in bgs 5/20/2015	Grid 5-Sieved 0-2in bgs 6/11/2015	Grid 5 2-6in bgs 5/20/2015	Grid 5-Sieved 2-6in bgs 6/10/2015	Grid 5 6-12in bgs 5/20/2015	Grid 5 12-24in bgs 5/20/2015
Polychlorinated Biphenyls										
Aroclor-1260	11096-82-5	mg/kg	0.24	--	0.04 U	NA	0.038 U	NA	0.038 U	0.038 U
Pesticides										
4,4'-DDD	72-54-8	mg/kg	2.3	--	0.00085 LJ	NA	0.00075 LJ	NA	0.00023 LJ	0.0038 U
4,4'-DDE	72-55-9	mg/kg	2	--	0.0013 LJ	NA	0.00068 LJ	NA	0.00018 LJ	0.00079 LJ
4,4'-DDT	50-29-3	mg/kg	1.9	--	0.0017 LJ	NA	0.00099 LJ	NA	0.00033 LJ	0.000071 LJ
alpha-BHC	319-84-6	mg/kg	0.086	--	0.00021 LJ	NA	0.00033 LJ	NA	0.000043 LJ	0.000019 LJ
alpha-Chlordane	5103-71-9	mg/kg	NP	--	0.002 U	NA	0.002 U	NA	0.002 U	0.002 U
beta-BHC	319-85-7	mg/kg	0.3	--	0.00052 LJ	NA	0.0017 LJ	NA	0.00077 LJ	0.002 U
Carbazole	86-74-8	mg/kg	NP	--	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U
delta-BHC	319-86-8	mg/kg	NP	--	0.002 U	NA	0.002 U	NA	0.002 U	0.002 U
Dieldrin	60-57-1	mg/kg	0.034	--	0.004 U	NA	0.0038 U	NA	0.0038 U	0.00026 LJ
Endosulfan I	959-98-8	mg/kg	NP	--	0.002 U	NA	0.002 U	NA	0.002 U	0.002 U
Endosulfan II	33213-65-9	mg/kg	NP	--	0.00066 LJ	NA	0.00078 LJ	NA	0.000029 LJ	0.000053 LJ
Endosulfan sulfate	1031-07-8	mg/kg	NP	--	0.00014 LJ	NA	0.0038 U	NA	0.0038 U	0.00052 LJ
Endrin	72-20-8	mg/kg	19	--	0.004 U	NA	0.00098 LJ	NA	0.00077 LJ	0.0038 U
Endrin ketone	53494-70-5	mg/kg	NP	--	0.00035 LJ	NA	0.00027 LJ	NA	0.00018 LJ	0.0038 U
gamma-BHC (Lindane)	58-89-9	mg/kg	0.57	--	0.00084 LJ	NA	0.00049 LJ	NA	0.00015 LJ	0.002 U
gamma-Chlordane	5103-74-2	mg/kg	NP	--	0.00015 LJ	NA	0.00033 LJ	NA	0.0002 LJ	0.00015 LJ
Heptachlor	76-44-8	mg/kg	0.13	--	0.002 U	NA	0.0002 LJ	NA	0.002 U	0.002 U
Heptachlor epoxide	1024-57-3	mg/kg	0.07	--	0.002 U	NA	0.002 U	NA	0.002 U	0.002 U
Methoxychlor	72-43-5	mg/kg	320	--	0.0014 LJ	NA	0.02 U	NA	0.02 U	0.02 U



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 5 0-2in bgs 5/20/2015	Grid 5-Sieved 0-2in bgs 6/11/2015	Grid 5 2-6in bgs 5/20/2015	Grid 5-Sieved 2-6in bgs 6/10/2015	Grid 5 6-12in bgs 5/20/2015	Grid 5 12-24in bgs 5/20/2015
Semi-volatile Organic Compounds										
4-Methylphenol	106-44-5	mg/kg	6300	--	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	39	--	0.046 LJ	NA	0.028 LJ	NA	0.2 U	0.2 U
Chrysene	218-01-9	mg/kg	16	--	NA	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	mg/kg	73	--	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U
Di-n-butylphthalate	84-74-2	mg/kg	6300	--	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U
Fluoranthene	206-44-0	mg/kg	2400	--	NA	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	mg/kg	NP	--	NA	NA	NA	NA	NA	NA
Pyrene	129-00-0	mg/kg	1800	--	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (SIM)										
2-Methylnaphthalene	91-57-6	mg/kg	240	--	0.0079 UJ	NA	0.015 UJ	NA	0.0038 UJ	0.0018 LJ
Acenaphthene	83-32-9	mg/kg	3600	--	0.0079 UJ	NA	0.015 UJ	NA	0.0038 UJ	0.0039 U
Acenaphthylene	208-96-8	mg/kg	NP	--	0.0061 LJ	NA	0.0069 LJ	NA	0.0043 J	0.0039 U
Anthracene	120-12-7	mg/kg	18000	--	0.0078 LJ	NA	0.0077 LJ	NA	0.0035 LJ	0.0039 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	0.027 J	NA	0.054 J	NA	0.019 J	0.0039 U
Benzo(a)pyrene	50-32-8	mg/kg	0.016	--	0.019 J	NA	0.037 J	NA	0.012 J	0.0039 U
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	0.048 J	NA	0.07 J	NA	0.025 J	0.0039 U
Benzo(g,h,i)perylene	191-24-2	mg/kg	NP	--	0.0057 LJ	NA	0.0085 LJ	NA	0.0019 LJ	0.0039 U
Benzo(k)fluoranthene	207-08-9	mg/kg	1.6	--	0.014 J	NA	0.022 J	NA	0.0079 J	0.0039 U
Chrysene	218-01-9	mg/kg	16	--	0.035 J	NA	0.057 J	NA	0.021 J	0.0039 U
Dibenzo(a,h)anthracene	53-70-3	mg/kg	0.016	--	0.0067 LJ	NA	0.0086 LJ	NA	0.0033 LJ	0.0039 U
Fluoranthene	206-44-0	mg/kg	2400	--	0.024 J	NA	0.071 J	NA	0.02 J	0.0039 U
Fluorene	86-73-7	mg/kg	2400	--	0.0079 UJ	NA	0.015 UJ	NA	0.0038 UJ	0.0039 U
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0.16	--	0.027 J	NA	0.034 J	NA	0.013 J	0.0039 U
Naphthalene	91-20-3	mg/kg	3.8	--	0.0023 LJ	NA	0.015 UJ	NA	0.0038 UJ	0.0018 LJ
Pentachlorophenol	87-86-5	mg/kg	1	--	0.0025 LJ	NA	NA	NA	0.00098 LJ	0.0079 U
Phenanthrene	85-01-8	mg/kg	NP	--	0.0054 LJ	NA	0.013 LJ	NA	0.0032 LJ	0.0039 U
Pyrene	129-00-0	mg/kg	1800	--	0.025 J	NA	0.065 J	NA	0.021 J	0.0039 U



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 5 0-2in bgs 5/20/2015	Grid 5-Sieved 0-2in bgs 6/11/2015	Grid 5 2-6in bgs 5/20/2015	Grid 5-Sieved 2-6in bgs 6/10/2015	Grid 5 6-12in bgs 5/20/2015	Grid 5 12-24in bgs 5/20/2015
Volatile Organic Compounds										
2-Butanone	78-93-3	mg/kg	27000	--	0.01 U	NA	0.011 U	NA	0.011 U	0.011 U
Acetone	67-64-1	mg/kg	61000	--	0.01 U	NA	0.011 U	NA	0.0053 U	0.0036 U
Chloroform	67-66-3	mg/kg	0.32	--	0.0052 U	NA	0.0054 U	NA	0.0057 U	0.0056 U
Methylene chloride	75-09-2	mg/kg	57	--	0.0052 U	NA	0.00024 U	NA	0.00043 U	0.0056 U
Toluene	108-88-3	mg/kg	4900	--	0.0016 U	NA	0.0006 U	NA	0.00093 U	0.0008 U

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

NA - Not Analyzed

Yellow highlighted cells exceed RSL

NP - Not Published

U - Not Detected at reported quantitation limit

J - Estimated Value

L - Reported concentration is below the CRQL

R - Unusable

mg/kg-milligrams per kilogram

SIM-selected ion monitoring

BOLD-indicates a detected concentration

in-inches

bgs-below ground surface



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 6 0-2in bgs 5/20/2015	Grid 6-Sieved 0-2in bgs 6/11/2015	Grid 6 2-6in bgs 5/20/2015	Grid 6-Sieved 2-6in bgs 6/10/2015	Grid 6 6-12in bgs 5/20/2015
Metals									
Aluminum	7429-90-5	mg/kg	77000	--	1430	2860	3140	2830	3070
Antimony	7440-36-0	mg/kg	31	--	0.5 U	0.77 UJ	0.5 U	0.89 UJ	0.5 U
Arsenic	7440-38-2	mg/kg	0.68	--	1	1.2	1.9	1.3	2.2
Barium	7440-39-3	mg/kg	15000	--	19.6	28.9	18.7	31.7	23.3
Beryllium	7440-41-7	mg/kg	160	--	0.5 U	0.39 U	0.5 U	0.45 U	0.5 U
Cadmium	7440-43-9	mg/kg	71	--	0.5 U	0.39 U	0.5 U	0.45 U	0.5 U
Calcium	7440-70-2	mg/kg	NP	--	1360	851	746	768	671
Chromium	7440-47-3	mg/kg	NP	--	4.5	5.9	4.5	6	4.8
Cobalt	7440-48-4	mg/kg	23	--	2.2 U	1.9	2.3	2.2	4.6
Copper	7440-50-8	mg/kg	3100	--	4.3	14	3.8	27.6	5.8
Iron	7439-89-6	mg/kg	55000	--	2700	4390	5940	4480	7940
Lead	7439-92-1	mg/kg	400	--	12	20.3	6.9	19.2	7.4
Magnesium	7439-95-4	mg/kg	NP	--	613	425	338	382	291
Manganese	7439-96-5	mg/kg	1800	--	102	135	76.8	151	190
Mercury	7439-97-6	mg/kg	9.4	--	0.082 U	0.042 LJ	0.08 U	0.057 LJ	0.079 U
Nickel	7440-02-0	mg/kg	1500	--	2.2 U	3.2	2.3	3.6	2.4
Potassium	7440-09-7	mg/kg	NP	--	330	457	388	403	332
Selenium	7782-49-2	mg/kg	390	--	1.1 U	1.9 U	1.1 U	2.2 U	1.1 U
Sodium	7440-23-5	mg/kg	NP	--	54.3 U	350 U	53.5 U	343 U	53.7 U
Vanadium	7440-62-2	mg/kg	390	--	4.6	8.4	9.3	9.8	11.7
Zinc	7440-66-6	mg/kg	23000	--	31	51.2 J	12.2	49.5	14.7



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 6 0-2in bgs 5/20/2015	Grid 6-Sieved 0-2in bgs 6/11/2015	Grid 6 2-6in bgs 5/20/2015	Grid 6-Sieved 2-6in bgs 6/10/2015	Grid 6 6-12in bgs 5/20/2015
Polychlorinated Biphenyls									
Aroclor-1260	11096-82-5	mg/kg	0.24	--	0.04 U	NA	0.038 U	NA	0.037 U
Pesticides									
4,4'-DDD	72-54-8	mg/kg	2.3	--	0.00063 LJ	NA	0.00029 LJ	NA	0.0037 U
4,4'-DDE	72-55-9	mg/kg	2	--	0.000079 LJ	NA	0.00014 LJ	NA	0.00012 LJ
4,4'-DDT	50-29-3	mg/kg	1.9	--	0.00028 LJ	NA	0.0011 LJ	NA	0.00015 LJ
alpha-BHC	319-84-6	mg/kg	0.086	--	0.00036 LJ	NA	0.00037 LJ	NA	0.000025 LJ
alpha-Chlordane	5103-71-9	mg/kg	NP	--	0.002 U	NA	0.002 U	NA	0.0019 U
beta-BHC	319-85-7	mg/kg	0.3	--	0.00059 LJ	NA	0.00049 LJ	NA	0.00053 LJ
Carbazole	86-74-8	mg/kg	NP	--	0.81 U	NA	0.2 U	NA	0.19 U
delta-BHC	319-86-8	mg/kg	NP	--	0.002 U	NA	0.002 U	NA	0.0019 U
Dieldrin	60-57-1	mg/kg	0.034	--	0.004 U	NA	0.0038 U	NA	0.0037 U
Endosulfan I	959-98-8	mg/kg	NP	--	0.00012 LJ	NA	0.002 U	NA	0.0019 U
Endosulfan II	33213-65-9	mg/kg	NP	--	0.00086 LJ	NA	0.00027 LJ	NA	0.000015 LJ
Endosulfan sulfate	1031-07-8	mg/kg	NP	--	0.00099 LJ	NA	0.0038 U	NA	0.0037 U
Endrin	72-20-8	mg/kg	19	--	0.004 U	NA	0.00053 LJ	NA	0.00057 LJ
Endrin ketone	53494-70-5	mg/kg	NP	--	0.00014 LJ	NA	0.00026 LJ	NA	0.00021 LJ
gamma-BHC (Lindane)	58-89-9	mg/kg	0.57	--	0.00038 LJ	NA	0.00073 LJ	NA	0.00015 LJ
gamma-Chlordane	5103-74-2	mg/kg	NP	--	0.00039 LJ	NA	0.00017 LJ	NA	0.0019 U
Heptachlor	76-44-8	mg/kg	0.13	--	0.000085 LJ	NA	0.00068 LJ	NA	0.0019 U
Heptachlor epoxide	1024-57-3	mg/kg	0.07	--	0.00041 LJ	NA	0.002 U	NA	0.0019 U
Methoxychlor	72-43-5	mg/kg	320	--	0.00065 LJ	NA	0.00087 LJ	NA	0.0013 LJ



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 6 0-2in bgs 5/20/2015	Grid 6-Sieved 0-2in bgs 6/11/2015	Grid 6 2-6in bgs 5/20/2015	Grid 6-Sieved 2-6in bgs 6/10/2015	Grid 6 6-12in bgs 5/20/2015
Semi-volatile Organic Compounds									
4-Methylphenol	106-44-5	mg/kg	6300	--	0.81 U	NA	0.2 U	NA	0.19 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	39	--	0.21 LJ	NA	0.021 LJ	NA	0.19 U
Chrysene	218-01-9	mg/kg	16	--	NA	NA	NA	NA	NA
Dibenzofuran	132-64-9	mg/kg	73	--	0.81 U	NA	0.2 U	NA	0.19 U
Di-n-butylphthalate	84-74-2	mg/kg	6300	--	0.064 LJ	NA	0.2 U	NA	0.19 U
Fluoranthene	206-44-0	mg/kg	2400	--	NA	NA	NA	NA	NA
Phenanthrene	85-01-8	mg/kg	NP	--	NA	NA	NA	NA	NA
Pyrene	129-00-0	mg/kg	1800	--	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (SIM)									
2-Methylnaphthalene	91-57-6	mg/kg	240	--	0.016 UJ	NA	0.002 LJ	NA	0.0037 U
Acenaphthene	83-32-9	mg/kg	3600	--	0.016 UJ	NA	0.0038 UJ	NA	0.0037 U
Acenaphthylene	208-96-8	mg/kg	NP	--	0.016 UJ	NA	0.00088 LJ	NA	0.0037 U
Anthracene	120-12-7	mg/kg	18000	--	0.016 UJ	NA	0.0015 LJ	NA	0.0037 U
Benzo(a)anthracene	56-55-3	mg/kg	0.16	--	0.0077 LJ	NA	0.0032 LJ	NA	0.0037 U
Benzo(a)pyrene	50-32-8	mg/kg	0.016	--	0.0067 LJ	NA	0.0019 LJ	NA	0.0037 U
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16	--	0.017 J	NA	0.0045 J	NA	0.00092 LJ
Benzo(g,h,i)perylene	191-24-2	mg/kg	NP	--	0.016 UJ	NA	0.0038 UJ	NA	0.0037 U
Benzo(k)fluoranthene	207-08-9	mg/kg	1.6	--	0.0041 LJ	NA	0.0013 LJ	NA	0.0037 U
Chrysene	218-01-9	mg/kg	16	--	0.013 LJ	NA	0.0042 J	NA	0.00082 LJ
Dibenzo(a,h)anthracene	53-70-3	mg/kg	0.016	--	0.016 UJ	NA	0.0038 UJ	NA	0.0037 U
Fluoranthene	206-44-0	mg/kg	2400	--	0.01 LJ	NA	0.004 J	NA	0.0037 U
Fluorene	86-73-7	mg/kg	2400	--	0.016 UJ	NA	0.0038 UJ	NA	0.0037 U
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0.16	--	0.0079 LJ	NA	0.0023 LJ	NA	0.0037 U
Naphthalene	91-20-3	mg/kg	3.8	--	0.016 UJ	NA	0.0011 LJ	NA	0.0037 U
Pentachlorophenol	87-86-5	mg/kg	1	--	NA	NA	NA	NA	0.0075 U
Phenanthrene	85-01-8	mg/kg	NP	--	0.016 UJ	NA	0.002 LJ	NA	0.0037 U
Pyrene	129-00-0	mg/kg	1800	--	0.015 LJ	NA	0.0045 J	NA	0.0037 U



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level	Property 017 Sample ID Depth Date	Grid 6 0-2in bgs 5/20/2015	Grid 6-Sieved 0-2in bgs 6/11/2015	Grid 6 2-6in bgs 5/20/2015	Grid 6-Sieved 2-6in bgs 6/10/2015	Grid 6 6-12in bgs 5/20/2015
Volatile Organic Compounds									
2-Butanone	78-93-3	mg/kg	27000	--	0.0086 LJ	NA	0.0094 U	NA	0.0089 LJ
Acetone	67-64-1	mg/kg	61000	--	0.012	NA	0.0094 U	NA	0.0077 LJ
Chloroform	67-66-3	mg/kg	0.32	--	0.0047 U	NA	0.0047 U	NA	0.0045 U
Methylene chloride	75-09-2	mg/kg	57	--	0.00028 LJ	NA	0.0047 U	NA	0.00024 LJ
Toluene	108-88-3	mg/kg	4900	--	0.0011 LJ	NA	0.00073 LJ	NA	0.00081 LJ

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

NA - Not Analyzed

Yellow highlighted cells exceed RSL

NP - Not Published

U - Not Detected at reported quantitation limit

J - Estimated Value

L - Reported concentration is below the CRQL

R - Unusable

mg/kg-milligrams per kilogram

SIM-selected ion monitoring

BOLD-indicates a detected concentration

in-inches

bgs-below ground surface



Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Full List of Chemicals Analyzed in the Soil

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level
Metals			
Aluminum	7429-90-5	mg/kg	77000
Antimony	7440-36-0	mg/kg	31
Arsenic	7440-38-2	mg/kg	0.68
Barium	7440-39-3	mg/kg	15000
Beryllium	7440-41-7	mg/kg	160
Cadmium	7440-43-9	mg/kg	71
Calcium	7440-70-2	mg/kg	NP
Chromium	7440-47-3	mg/kg	NP
Cobalt	7440-48-4	mg/kg	23
Copper	7440-50-8	mg/kg	3100
Iron	7439-89-6	mg/kg	55000
Lead	7439-92-1	mg/kg	400
Magnesium	7439-95-4	mg/kg	NP
Manganese	7439-96-5	mg/kg	1800
Mercury	7439-97-6	mg/kg	9.4
Nickel	7440-02-0	mg/kg	1500
Potassium	7440-09-7	mg/kg	NP
Selenium	7782-49-2	mg/kg	390
Silver	7440-22-4	mg/kg	390
Sodium	7440-23-5	mg/kg	NP
Thallium	7440-28-0	mg/kg	0.78
Vanadium	7440-62-2	mg/kg	390
Zinc	7440-66-6	mg/kg	23000
Pesticides			
4,4'-DDD	72-54-8	mg/kg	2.3
4,4'-DDE	72-55-9	mg/kg	2
4,4'-DDT	50-29-3	mg/kg	1.9
Acetophenone	98-86-2	mg/kg	7800
Aldrin	309-00-2	mg/kg	0.039
alpha-BHC	319-84-6	mg/kg	0.086
alpha-Chlordane	5103-71-9	mg/kg	NP
Atrazine	1912-24-9	mg/kg	2.4
Benzaldehyde	100-52-7	mg/kg	7800
beta-BHC	319-85-7	mg/kg	0.3
Caprolactam	105-60-2	mg/kg	31000
Carbazole	86-74-8	mg/kg	NP
delta-BHC	319-86-8	mg/kg	NP
Dieldrin	60-57-1	mg/kg	0.034
Endosulfan I	959-98-8	mg/kg	NP
Endosulfan II	33213-65-9	mg/kg	NP
Endosulfan sulfate	1031-07-8	mg/kg	NP
Endrin	72-20-8	mg/kg	19
Endrin aldehyde	7421-93-4	mg/kg	NP
Endrin ketone	53494-70-5	mg/kg	NP
gamma-BHC (Lindane)	58-89-9	mg/kg	0.57
gamma-Chlordane	5103-74-2	mg/kg	NP
Heptachlor	76-44-8	mg/kg	0.13
Heptachlor epoxide	1024-57-3	mg/kg	0.07
Methoxychlor	72-43-5	mg/kg	320
Toxaphene	8001-35-2	mg/kg	0.49

mg/kg-milligrams per kilogram

NP - Not Published

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level
Polychlorinated Biphenyls			
Aroclor-1016	12674-11-2	mg/kg	4.1
Aroclor-1221	11104-28-2	mg/kg	0.17
Aroclor-1232	11141-16-5	mg/kg	0.17
Aroclor-1242	53469-21-9	mg/kg	0.23
Aroclor-1248	12672-29-6	mg/kg	0.23
Aroclor-1254	11097-69-1	mg/kg	0.24
Aroclor-1260	11096-82-5	mg/kg	0.24
Aroclor-1262	37324-23-5	mg/kg	NP
Aroclor-1268	11100-14-4	mg/kg	NP
Volatile Organic Compounds			
1,1,1-Trichloroethane	71-55-6	mg/kg	8100
1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	0.6
1,1,2-Trichloroethane	79-00-5	mg/kg	1.1
1,1-Dichloroethane	75-34-3	mg/kg	3.6
1,1-Dichloroethene	75-35-4	mg/kg	230
1,2,3-Trichlorobenzene	87-61-6	mg/kg	63
1,2-Dibromo-3-chloropropane	96-12-8	mg/kg	0.0053
1,2-Dibromoethane	106-93-4	mg/kg	0.036
1,2-Dichlorobenzene	95-50-1	mg/kg	1800
1,2-Dichloroethane	107-06-2	mg/kg	0.46
1,2-Dichloropropane	78-87-5	mg/kg	1
1,3-Dichlorobenzene	541-73-1	mg/kg	NP
1,4-Dichlorobenzene	106-46-7	mg/kg	2.6
2-Butanone	78-93-3	mg/kg	27000
2-Hexanone	591-78-6	mg/kg	200
4-Methyl-2-Pentanone	108-10-1	mg/kg	5300
Acetone	67-64-1	mg/kg	61000
Benzene	71-43-2	mg/kg	1.2
Bromochloromethane	74-97-5	mg/kg	150
Bromodichloromethane	75-27-4	mg/kg	0.29
Bromoform	75-25-2	mg/kg	19
Bromomethane	74-83-9	mg/kg	6.8
Carbon disulfide	75-15-0	mg/kg	770
Carbon tetrachloride	56-23-5	mg/kg	0.65
Chlorobenzene	108-90-7	mg/kg	280
Chloroethane	75-00-3	mg/kg	14000
Chloroform	67-66-3	mg/kg	0.32
Chloromethane	74-87-3	mg/kg	110
cis-1,2-Dichloroethene	156-59-2	mg/kg	160
cis-1,3-Dichloropropene	10061-01-5	mg/kg	NP
Cyclohexane	110-82-7	mg/kg	6500
Dibromochloromethane	124-48-1	mg/kg	0.75
Dichlorodifluoromethane	75-71-8	mg/kg	87
Ethylbenzene	100-41-4	mg/kg	5.8
Isopropylbenzene	98-82-8	mg/kg	1900
m,p-Xylene	83-38-3/106-4	mg/kg	550
Methyl acetate	79-20-9	mg/kg	78000
Methyl tert-butyl ether	1634-04-4	mg/kg	47
Methylcyclohexane	108-87-2	mg/kg	NP
Methylene chloride	75-09-2	mg/kg	57
o-Xylene	95-47-6	mg/kg	650
Styrene	100-42-5	mg/kg	6000
Tetrachloroethene	127-18-4	mg/kg	24
Toluene	108-88-3	mg/kg	4900
trans-1,2-Dichloroethene	156-60-5	mg/kg	1600
trans-1,3-Dichloropropene	10061-02-6	mg/kg	NP
Trichloroethene	79-01-6	mg/kg	0.94
Trichlorofluoromethane	75-69-4	mg/kg	730
Vinyl chloride	75-01-4	mg/kg	0.059

Enclosure 3: Table 2

Wilcox Oil
Soil Analytical Data
Bristow, OK

Full List of Chemicals Analyzed in the Soil

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level
Semi-volatile Organic Compounds			
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	mg/kg	40000
1,1'-Biphenyl	92-52-4	mg/kg	47
1,2,4,5-Tetrachlorobenzene	95-94-3	mg/kg	23
1,2,4-Trichlorobenzene	120-82-1	mg/kg	24
1,4-Dioxane	123-91-1	mg/kg	5.3
2,2'-Oxybis(1-chloropropane)	108-60-1	mg/kg	4.9
2,3,4,6-Tetrachlorophenol	58-90-2	mg/kg	1900
2,4,5-Trichlorophenol	95-95-4	mg/kg	6300
2,4,6-Trichlorophenol	88-06-2	mg/kg	49
2,4-Dichlorophenol	120-83-2	mg/kg	190
2,4-Dimethylphenol	105-67-9	mg/kg	1300
2,4-Dinitrophenol	51-28-5	mg/kg	130
2,4-Dinitrotoluene	121-14-2	mg/kg	1.7
2,6-Dinitrotoluene	606-20-2	mg/kg	0.36
2-Chloronaphthalene	91-58-7	mg/kg	4800
2-Chlorophenol	95-57-8	mg/kg	390
2-Methylnaphthalene	91-57-6	mg/kg	240
2-Methylphenol	95-48-7	mg/kg	3200
2-Nitroaniline	88-74-4	mg/kg	630
2-Nitrophenol	88-75-5	mg/kg	NP
3,3'-Dichlorobenzidine	91-94-1	mg/kg	1.2
3-Nitroaniline	99-09-2	mg/kg	NP
4,6-Dinitro-2-methylphenol	534-52-1	mg/kg	5.1
4-Bromophenyl-phenylether	101-55-3	mg/kg	NP
4-Chloro-3-methylphenol	59-50-7	mg/kg	6300
4-Chloroaniline	106-47-8	mg/kg	2.7
4-Chlorophenyl-phenylether	7005-72-3	mg/kg	NP
4-Methylphenol	106-44-5	mg/kg	6300
4-Nitroaniline	100-01-6	mg/kg	27
4-Nitrophenol	100-02-7	mg/kg	NP
Benzo(a)anthracene	56-55-3	mg/kg	0.16
Benzo(a)pyrene	50-32-8	mg/kg	0.016
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16
Bis(2-chloroethoxy)methane	111-91-1	mg/kg	190
Bis(2-chloroethyl)ether	111-44-4	mg/kg	0.23
Bis(2-ethylhexyl)phthalate	117-81-7	mg/kg	39
Butylbenzylphthalate	85-68-7	mg/kg	290
Chrysene	218-01-9	mg/kg	16
Dibenzofuran	132-64-9	mg/kg	73
Diethylphthalate	84-66-2	mg/kg	51000
Dimethylphthalate	131-11-3	mg/kg	NP
Di-n-butylphthalate	84-74-2	mg/kg	6300
Di-n-octylphthalate	117-84-0	mg/kg	630
Fluoranthene	206-44-0	mg/kg	2400
Hexachlorobenzene	118-74-1	mg/kg	0.21
Hexachlorobutadiene	87-68-3	mg/kg	1.2
Hexachlorocyclopentadiene	77-47-4	mg/kg	1.8
Hexachloroethane	67-72-1	mg/kg	1.8
Isophorone	78-59-1	mg/kg	570
Nitrobenzene	98-95-3	mg/kg	5.1
N-Nitroso-di-n-propylamine	621-64-7	mg/kg	0.078
N-Nitrosodiphenylamine	86-30-6	mg/kg	110
Pentachlorophenol	87-86-5	mg/kg	1
Phenanthrene	85-01-8	mg/kg	NP
Phenol	108-95-2	mg/kg	19000
Pyrene	129-00-0	mg/kg	1800

Analyte	CAS.NO	Units	EPA Residential Soil Screening Level
Semi-volatile Organic Compounds (SIM)			
2-Methylnaphthalene	91-57-6	mg/kg	240
Acenaphthene	83-32-9	mg/kg	3600
Acenaphthylene	208-96-8	mg/kg	NP
Anthracene	120-12-7	mg/kg	18000
Benzo(a)anthracene	56-55-3	mg/kg	0.16
Benzo(a)pyrene	50-32-8	mg/kg	0.016
Benzo(b)fluoranthene	205-99-2	mg/kg	0.16
Benzo(g,h,i)perylene	191-24-2	mg/kg	NP
Benzo(k)fluoranthene	207-08-9	mg/kg	1.6
Chrysene	218-01-9	mg/kg	16
Dibenzo(a,h)anthracene	53-70-3	mg/kg	0.016
Fluoranthene	206-44-0	mg/kg	2400
Fluorene	86-73-7	mg/kg	2400
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	0.16
Naphthalene	91-20-3	mg/kg	3.8
Pentachlorophenol	87-86-5	mg/kg	1
Phenanthrene	85-01-8	mg/kg	NP
Pyrene	129-00-0	mg/kg	1800

mg/kg-milligrams per kilogram

SIM-selected ion monito

NP - Not Published

Residential Soil Screening Level- June 2015 EPA Residential Soil RSL

Enclosure 4: Agency for Toxic Substances and Disease Registry Fact Sheets

Enclosure 4: Agency for Toxic Substances and Disease Registry fact sheets for Arsenic and Polycyclic Aromatic Hydrocarbons

Arsenic - ToxFAQs™

CAS # 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts.

Arsenic has been found in at least 1,149 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic

Arsenic

CAS # 7440-38-2

compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air ($10 \mu\text{g}/\text{m}^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Health and Human Services. Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaqs/index.asp>.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pōl'ī-sī'klīk ār'ā-măt'īk hī'drō-kār'bōnz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.

- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

Polycyclic Aromatic Hydrocarbons

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.

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